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ABSTRACT

This paper provides an overview of graduate education financial aid statistics and the results of a study designed to compare minority and white graduate students' chances of receiving various forms of financial aid by virtue of a range of background characteristics. The study, which sought to replicate earlier research by Malaney (1987), is based on a subset of data from the 1989-90 National Postsecondary Student Aid Survey, namely 7,318 masters and doctoral students. It sought to test the hypothesis that on the basis of citizenship, degree level, sex, ethnicity, age, cumulative grade point average, and area of study (pure, applied, hard, soft, life, or nonlife), minorities involved in doctoral study would have an equal probability with nonminorities in receiving fellowships, grants, assistantships, or taking out loans. The study found that while minorities were more likely to receive fellowships than nonminorities, minorities were less likely than nonminorities to receive administrative assistantships. Students in pure fields were found to be more likely to receive financial aid than students in applied fields. An appendix contains the classification scheme for pure, applied, hard, soft, life, and nonlife fields. (Contains 18 references.) (MDM)

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An Exploratory Study of the Role of Financial Aid in Minority Doctoral Education

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An Exploratory Study of the Role of Financial Aid in Minority Doctoral Education

Introduction

None of the Carnegie I universities has a faculty that resembles the demographics of the American population. The most common explanations offered for this phenomenon include the following: poor preparation of minority students for college and beyond; financial pressures on minority students; problems with minority recruitment; minority retention; and inattention to minority community issues. (Nettles, 1990, Girves and Wemmerus, 1988, Melendez, 1994). While affirmative action programs appear to have resulted in increased hiring of minority faculty, at least at the assistant professor level, the supply is limited and the external mobility high (Brown, 1994). Since an earned doctorate degree is a pre-requisite achievement for faculty in Carnegie I Class universities, unless minorities achieve doctorates in all fields in greater numbers than presently, the composition of university faculties will never reflect the population. In academic fields, it is a truism that the earned doctorate is critical to upward professional mobility. Without minorities achieving doctorates in all fields, the composition of university faculties will never authentically reflect the population. Worse still, if the process is as cyclical as Brown (1994) suggests, the lack of minority faculty will be reflected in minority student attrition with its consequent long-term effect. The challenge is to dramatically expand the supply of minority PhDs.

Recent trends in minority participation in higher education give little reason to be optimistic. In order to examine the challenges to increasing the number of minority doctorates, this paper presents an overview of graduate education financial aid statistics, and proposes to compare minorities and whites' chances of receiving various forms of financial aid, by virtue of a range of background characteristics.

Table 1: Enrollments and Degrees Conferred by Race/Ethnicity 1990-91

	Indians	Blacks	Asian	Hispanic	White	Non-res. alien
Total public enrollment elementary/high schools (%)	1	16.4	3.4	11.8	67.4	N.A.
Higher Ed students (%)	0.8	9.6	4.6	6.2	78.8	0.08
Undergraduate (%)	0.8	9.8	4.3	6.2	79	N.A.
Graduate (%)	0.4	5.9	3.8	3.3	86.6	N.A.
Degrees conferred (1990-91)						
Bachelor's (%)	0.4	6	3.8	3.4	83.6	2.7
Master's (%)	0.3	4.9	3.4	2.6	77.7	11.1
Doctorates (%)	0.3	3.1	3.8	1.9	65.7	25.2

1994 Digest of Education Statistics

The educational pool

To begin with, the pool from which minority PhD candidates emerge is different for every group (Table 1). In 1990-91, Hispanics, for example, accounted for only 5.8 percent of all higher education students even though they represented 11.8 percent of the elementary and secondary population. Ultimately, Hispanics represented 1.9 percent of all doctorates granted in 1990-91. About 37.4 percent of these Hispanic doctorates were in one of two fields: social sciences or education.

For African Americans, the picture differs in subtle ways. While in 1990-91, African Americans accounted for 16.4 percent of the elementary and high school population, they represented 9.3 percent of all students in higher education and received 3.1 percent of all doctorates granted that year. Again, more than 50 percent of the doctorates to African Americans were awarded in the fields of education and the social sciences.

Asian Americans, by 1990-91, made up 3.4 percent of the elementary and high school population. However, their representation in higher education rose to 4

percent. Asian-Americans earned 3.8 percent of all doctorates in 1990-91, with nearly 55 percent of these in the areas of engineering, mathematics, life sciences and physical sciences.

In 1990-91, Native Americans accounted for one percent of all elementary and high school students and less than 0.8 percent of all higher education students. In that period, this group earned 0.3 percent of all doctorates granted. Of these, 36 percent were in education, and another 25 percent were in the social sciences.

Comparisons of doctorate financing for U.S. citizens

Table 2: Primary Sources of Financial Support - by Race 1990-91

	Indians	Blacks	Asians	Hispanics	Whites
Personal resources	58%	60%	34%	49%	48%
Institutional aid	27%	25%	50%	37%	42%

National Research Council, Survey of Earned Doctorates

The various ethnic groups differed considerably from each other and from whites on the means of financing their doctoral education. In 1991, the National Research Council found that 60 percent of African American doctorate recipients had used personal resources, including loans, as the primary means of support for their graduate education (Table 2). This compared to 58 percent for American Indians, 49 percent for Hispanics, 48 percent for whites, and 34 percent for Asians. University aid was cited as the primary source of support for 50 percent of Asians, 42 percent of whites, 37 percent of Hispanics, 27 percent of Native Americans and 25 percent of African Americans.

Literature Review

Previous studies have identified a range of factors which are believed to relate to the numbers of minority doctorate recipients. These factors include: the diminishing pool of potential minority doctorate students; the role played by assistantships in minority doctorate education; institutional support for international students versus support for minority U.S. students; and personal characteristics of those students receiving financial aid. We will proceed to discuss these findings using these categories.

The diminishing pool

Trends in minority degree production such as those noted in the previous section have important implications for the possibility of increasing the numbers of some racial and ethnic groups. Carter and Wilson (1991) found that while minority undergraduate degree attainment increased between 1976 and 1989, this change was largely due to the Asian American increase of 2.6 percent to 3.8 percent; African Americans declined from 6.6 to 5.7 percent; Native Americans stayed virtually constant at 0.4 percent; Hispanics increased slightly from 2.0 to 2.9 percent. But Carter and Wilson (1991) also found that minority degree attainment decreases further as one moves higher in the educational hierarchy. In other words, with the exception of Asian Americans, there seems to be a diminishing pool of potential minority graduate students attending and completing college (Melendez, 1994).

Likewise, Brown (1987) noted undergraduate degree-attainment rates in the fields favored by non-Asian minorities declined markedly between 1978 and 1984. She too concluded that this decline at the undergraduate level explains their declining enrollment in graduate education. Nettles (1987) and Brown (1987) both identify a number of factors contributing to minority underrepresentation at the graduate level. These include: low GRE scores among minorities; lower undergraduate grades; less

frequent interaction with undergraduate faculty; and rising admission standards for public colleges and universities.

Financial differences among minorities

Financial factors appear to be another important contributor to the underrepresentation of most minorities at the doctoral level. In his study of 1,352 doctoral students in large public institutions, Nettles (1990) found that 46 percent of African American and 43 percent of Hispanic graduate students still had unpaid loans for undergraduate education, compared to 36 percent of white students. Also Hispanics on average had borrowed more than both African American and white students.

Differences in the distribution of institutional financial support may also be a factor in the low enrollment and production of minority doctorates. Nettles (1990) reported that of his 1,352-student sample, 54 percent of white students in his study received a teaching or research assistantship, compared with 38 percent of the African American scholars and 62 percent of Hispanics. As well, only 30 percent of his African American sample received a tuition waiver, compared with Hispanics (38 percent) and whites (39 percent).Of the three groups that Nettles studied, 30 percent of African Americans, 34 percent of Hispanics and 17 percent of whites received grants or fellowships. About 32 percent of Hispanic students received loans, versus 23 percent of African Americans and 15 percent of whites. Other factors that Nettles found contributed to receipt of doctoral fellowships and assistantships were high SES backgrounds, high undergraduate debt, high undergraduate GPAs and being male rather than female. While he related a criterion such as undergraduate GPA to receipt of fellowships and assistantships, he was unable to explain the positive relationship of SES, undergraduate debt and gender to the financial support awarded.

Role of assistantships

In addition to comparing the financial support received by the three groups, Nettles (1990) discovered that receipt of such fellowships and assistantships contributes to greater interaction with faculty, which in turn relates to the doctoral GPA and to the student's satisfaction with her/his graduate program.

Girves and Wemmerus (1988) tested a model of doctoral degree progress which included both financial support and perceptions of the faculty. Their sample of 948 graduate students was drawn from those who first entered graduate school at a major midwestern university in 1977. They found that involvement in one's program was directly related to degree progress, and that involvement in turn, rested on both financial support and students' perceptions of their relationship with faculty. They concluded that students who receive assistantships and/or fellowships are more likely to become involved in their programs, to work more closely with faculty and to become socialized faster. They suggested that the differences among fellowships, research and teaching assistantships may affect the degree of student socialization, with those working most closely with the faculty achieving greater departmental involvement and a strengthened commitment to degree progress. Further, they suggested that different types of awards may be appropriate to different stages of the degree process, with the emphasis on awards such as assistantships to new students in order to require interaction with faculty.

Support of international students

Also at issue is the citizenship of beneficiaries of these institutional support mechanisms. Coyle (1986) in his summary report based on National Research Council's Survey of Earned Doctorates found that universities spend significant amounts on non-U.S.-born, foreign or international doctoral students. For example, Coyle (1986) found that 61 percent of Asian international students got research

assistantships vs. 52 percent of Asian-American citizens; likewise 31 percent of African-American international students received research assistantships compared with 20 percent for African-American citizens; among Hispanics, 33 percent who were U.S. citizens received research assistantships compared with 40 percent of Hispanic international students. Hauptman (1986), using data from the National Center for Educational Statistics (NCES) and U.S. Census information, found that foreign students were less likely than domestic students to receive fellowships, but equally likely to receive teaching and research assistantships.

Who gets financial assistance?

National Research Council figures on 1984 doctorates point to large discrepancies among the various groups in the areas of teaching and research assistantships (Coyle, 1986). In 1984, 52 percent of Asian Americans and 38 percent of white students received research assistantships, compared with 22 percent of African Americans, 26 percent of Hispanics and 26 percent of Native Americans. On teaching assistantships, 48 percent of white students received this form of assistance, compared with 31 percent of African Americans, 39 percent of Hispanics, 39 percent of Asian Americans and 42 percent of Native Americans.

Several researchers including Baird (1976), Wong and Sanders (1983), Hauptman (1986), and Malaney (1987) have attempted to identify the characteristics of students who receive various types of financial support and attend graduate school. Baird (1976) conducted a study of 8,000 college seniors who were attending a representative sample of U.S. colleges and universities in the spring of 1971. He found the undergraduate grades of those who receive fellowships and scholarships were superior to those of nonrecipients, with 69 percent of recipients having undergraduate grades of B+ or higher, compared with 51 percent of the non-recipients. Baird (1976) also found that women were as well represented as men;

scholarship recipients tended to be younger than nonrecipients, and minorities were proportionately better represented among the recipients than nonrecipients. Both Baird (1976) and Hauptman (1986) noted differences in support for doctoral students based on their field of study. Hauptman (1986) found graduate students in the arts, humanities and social sciences were more likely to hold teaching assistantships, while those in engineering, physical and life sciences were more likely to have research assistantships. Earlier, Baird (1976) had found that students in biological and physical sciences were the most likely recipients of research assistantships. Since both Baird and Hauptman used national data, their findings may not reflect what is happening at individual institutions.

By contrast, Wong and Sanders (1983) concentrated on a single institution -- the University of California, Santa Barbara, studying all U.S. citizens who obtained PhDs there from 1972 to 1978. Based on a total of 112 females and 599 males, they found large differences between the sexes when they looked at research assistantships. Male graduate students enjoyed a substantial advantage over their female counterparts in both the natural sciences and the arts, but not in the social sciences. Women obtained research assistantships less frequently than men except in the social sciences. Male and female graduate students obtained roughly equal proportions of teaching assistantships, although men in natural sciences and arts held more teaching assistantships than in social sciences, a finding that was not confirmed for women. Wong and Sanders (1983) also noted that women generally received more fellowships than men, however, they suggested that this may have lowered the likelihood of the women obtaining research assistantships, with a possible subsequent effect on their integration into departmental activities.

Malaney (1987) also focused on a single institution, a large public research university in the Midwest, where he obtained a data base of 914 full-time students.

Since he determined that most part-timers were ineligible for the various types of financial support, they were omitted from the analysis. Malaney (1987) reported that undergraduate grades played the most significant role in the award of fellowships, predicting in fact, all forms of aid except research and administrative assistantships. He noted no differences in gender among the aid recipients except for loans, with women more likely to take out loans than men. Both Malaney (1987) and Baird (1976) observed a significant relationship between age and receipt of fellowship support. Like Baird, Malaney found that recipients of fellowships tended to be younger. As well, the Malaney (1987) study supported Baird's finding (1976) that proportionately minorities tend to receive fellowships more than nonminorities, although Malaney noted that the university studied has a special program to promote such aid. He suggested that minorities who do not receive aid are unlikely to attend school, although he offered no support for this view.

Like Hauptman (1986), Malaney (1987) found no difference between domestic and foreign students on teaching or research assistantships. Malaney, however, also found no difference between the two groups on fellowship aid, an area where Hauptman had found domestic students predominate. Malaney explained this difference by pointing out that Hauptman's national data included federally supported fellowships, many of which are not available to foreign students.

Malaney (1986) relied on the Biglan (1973) analysis to classify academic departments according to hard/soft area of study, pure/applied research emphasis, and life/nonlife area of study. Using this basis, Malaney's analysis (1986) found that students in the pure fields such as English, mathematics, physical and biological sciences, as opposed to applied fields such as communications and engineering, are more likely to receive fellowships and teaching assistantships, while graduate

students in applied areas are more likely to receive research and administrative assistantships than their counterparts in pure fields.

Malaney's 1987 study also supported Hauptman (1986) in finding that students in soft areas, such as social sciences, arts and humanities, and education were more likely to take out loans than were students in hard areas such as physical sciences and engineering.

Overall, Malaney found that high undergraduate grades and a high GRE verbal score were the most important variables in determining the level of funding received. However, he was unable to analyze two other aspects, which he believes, make important contributions to aid decisions. These are the recommendations from the student's undergraduate instructors and the strength of the department from which the student's undergraduate degree was earned. Both variables, he suggested, present problems in operationalizing.

Objective

Our goal is to replicate the Malaney study (1987) using national data, with a view toward establishing the likelihood of financial support for minority students pursuing doctorates. Are they competing from a level playing field in view of background characteristics? And if this is the case, is the financial support similarly distributed to minorities and nonminorities? These two aspects would appear to be critical to minority participation, and hence to any far-reaching change in faculty diversity.

Hypothesis to be tested

On the basis of citizenship, degree level, sex, ethnicity (U.S. only), age, undergraduate GPA, study in a hard or soft area, study in a pure or applied area, study in a life or nonlife area, minorities involved in doctoral study have an equal probability with nonminorities of receiving fellowships, grants, assistantships or taking out loans.

Data Base and Research Design

The data for this study were derived from the 1989-90 National Postsecondary Student Aid Survey (NPSAS), a nationally representative sample of all postsecondary students enrolled in the U.S. in the fall of 1989 and winter of 1990. This sample of approximately 70,000 included those who were full-time and part-time, students with financial aid and those without, undergraduate and graduate students and students pursuing professional degrees (law, medicine, business etc.) at 1,535 institutions. Institution types ranged from those that award doctoral degrees to those that offer three-month programs, including both public and private control and both profit and nonprofit entities. NPSAS also collected data from multiple sources such as parents, students, institutional transcripts and financial aid records. For this study we selected only the masters and doctoral students, for a sample total of 7,318.

Independent Variables

From this data base we selected the following data elements related to graduate students: citizenship, degree level, sex, ethnicity, age, cumulative GPA, study in a hard or soft area, study in a pure or applied area, study in a life or nonlife area. Because the NPSAS data did not include GRE scores or any similar measure, we were not able to follow Malaney's model on this measure. As well, we were not able to include undergraduate attendance at the same institution as an independent variable.

Citizenship, degree level, sex, and ethnicity were recoded as dichotomous variables with the following categories respectively: U.S. or non-U.S. citizen; masters or doctorate; male or female; minority or nonminority, with the minority category including only African Americans, Hispanic Americans, Asian Americans, and Native Americans. Age and cumulative GPAs were coded as continuous variables.

The other three independent variables relied on the three dimensions created by Biglan (1973), (Stoecker, 1993) to classify academic departments. These dimensions

relate to hard/soft area of study; pure or applied area of research; and life or nonlife area of study. The graduate sample was distributed among 50 of the 60 academic categories used for NPSAS coding. Since some of these categories did not correspond directly to the Biglan classifications or subsequent additions, some extrapolation was necessary. A table showing our division of the NPSAS categories using the Biglan schema may be found in Appendix A.

Dependent Variables

As dependent variables we examined the following: whether a student has received a fellowship or grant for which no services are required by the institution; whether a student holds a graduate research, teaching or administrative assistantship; and whether the student has taken out a loan. Each of these variables was coded as either yes or no. Finally, to conform with Malaney, a three-level variable called financial aid was computed. The three categories represent three hierarchical possibilities: no aid which means a student did not receive a fellowship or an assistantship; assistantship aid, which requires fixed work hours in exchange for a monthly stipend and tuition waiver; and fellowship aid, which provides both stipend and tuition waiver, but requires no service.

Analysis

Descriptives

Within each of the minority/nonminority categories we calculated the percentages of the group according to the numbers possessing the characteristics of the independent and dependent variables. (See Table 3). We found few major differences until we came to degree level. We found slightly more nonminorities proportionately in doctoral programs and in the hard and pure areas of study. On the dependent variables minorities receive proportionately more fellowships (4.6 percent versus 2.8 percent) and nonminorities receive proportionately more assistantships of all types. As for

Table 3: Descriptive Statistics by Race/Ethnicity and Citizenship

	U.S. Non-Minority or Foreign Citizen (5,841)	Minority (667)	U.S. Citizen (6,386)	Non-U.S. Citizen (932)
Independent Variables:				
Female	57.3%	58.2%	59.7%	41.7%
Male	42.7%	41.8%	40.3%	58.3%
GPA Category (1-6 high) (mean)	5.6	5.3	5.6	5.5
Age (mean)	33	33	33	31
Doctorate	15.2%	13.5%	13.0%	28.5%
Hard	28.4%	26.7%	25.2%	48.4%
Pure	24.3%	21.6%	23.0%	30.9%
Life	55.1%	54.3%	57.1%	40.8%
Dependent Variables:				
Fellowship	2.8%	4.6%	2.7%	5.0%
Teaching Assistantship	2.4%	1.6%	1.9%	4.9%
Research Assistantship	1.3%	1.2%	0.9%	3.8%
Administrative Assistantship	8.8%	5.1%	6.7%	20.0%
Loans	14.0%	19.4%	15.7%	6.7%
Work-study	1.8%	2.2%	1.8%	2.1%
Financial Aid				
No aid	86.3%	89.1%	89.0%	70.0%
Assistantships	10.9%	6.3%	8.3%	25.0%
Fellowships	2.8%	4.6%	2.7%	5.0%

NPSAS:90

loans, minorities take out a higher number of loans than nonminorities (19.4 percent versus 14.0 percent).

Considering the citizen/noncitizen categories, we found proportionately more females among graduate students who are U.S. citizens (59.7 percent versus 41.7 percent). In other words, more foreign students are males, judging by this sample. Proportionately, more of these noncitizens are doctoral students, indicating fewer students come from abroad at the masters level. Among the areas of study, nearly 50 percent of noncitizens are in the hard areas of study, compared with 25.2 percent of U.S. citizens. However, U.S. citizens are proportionately more represented in the life fields (57.1 percent compared with 40.8 percent for noncitizens). The data also show that proportionately more foreign students receive fellowships and assistantships of all types. Only on loans are U.S. citizens proportionately represented at a higher level.

Bivariate Analysis

Table 4 gives the Pearson r coefficients for the relationships between each independent variable and each dependent variable related to financial aid. We will discuss only the statistically significant relationships that were found.

For the fellowship variable, five relationships were significant to the .001 level; one to the .01 level and one to the .05 level. Work at the doctorate degree level and work in a pure area yield the strongest relationships with the fellowship variable, with both coefficients above .10. While it is not surprising that students at the doctorate level are more likely to receive fellowships than masters students, the likelihood that students will be from a pure as opposed to an applied field of study bears out previous findings. This is reinforced by the correlation between fellowships and study in a hard, as opposed to a soft area. Since these two collectively encompass many of the scientific fields, it seems likely that doctoral students in these fields have an edge.

Table 4: Pearson Product-Moment Coefficients of Correlations between Each Independent Variable and Each Dependent Variable Relating to Financial Aid

Independent Variables	(n)	Fellow	RA	TA	AA	Loan	AID
Citizenship	(7318)	-.0460***	-.0866***	-.0663***	-.1588***	.0856***	-.1604***
Degree level	(7318)	-.1530***	-.1117***	-.0851***	-.1786***	-.0078	-.2520***
Sex	(7318)	.0272*	.0555***	.0360**	.0833***	.0090	.0864***
Ethnicity	(7318)	.0324**	-.0017	-.0167	-.0401***	-.0467***	-.0067
Age	(7256)	-.0719***	-.0468***	-.0864***	-.1502***	-.1351***	-.1725***
GPA	(5730)	-.0190	.0043	-.0159	.0212	-.0636***	-.0013
Hard/soft area	(6508)	.0572***	.1186***	.0864***	.1713***	-.0075	.1796***
Pure/applied area	(6508)	.1231***	.0370**	.1231***	.1559***	.0773***	.2201***
Life/nonlife area	(6508)	-.0158	-.0224	-.0220	-.0655***	.0201	-.0616***

NPSAS:90
NOTE:
The *n* varies by independent variable and remains constant across dependent variables.
*p < .05; **p<.01; ***p<.001

Two other relationships that are significant at the .001 level involve the student's age and citizenship. The data show that younger students are more likely to receive fellowships than older ones, and non-citizens are more likely than citizens to receive this form of assistance. Less significant (.01 level) for the receipt of fellowships was minority status, however, considering U.S. citizens only, we found that minorities were more likely to receive fellowships than nonminorities. Finally, the sex of the student was found to be significant at the .05 level, with males more likely than females to receive fellowships.

Some similarities emerge when the award of research assistantships is considered. Five relationships -- citizenship, degree level, sex, age, hard area of study -- were significant to the .001 level, and one relationship -- a pure field -- was significant to the .01 level. Again, doctoral students in hard areas of study were more likely to receive this type of support. Like fellowships, research assistantships are more likely to go to younger students who are males, and who are noncitizens. These research assistantships are also somewhat likely to be awarded to students in pure, as opposed to applied areas of study.

The relationships involving teaching assistantships are similar to the foregoing. Again doctoral students are more likely than masters students to receive teaching assistantships, while work in both hard and pure areas continues to be important at the .001 significance level. Students who are younger, male and noncitizens show a greater likelihood of obtaining these awards (significant at the .001, .01 and .001 levels respectively).

The relationships involving administrative assistantships follow a similar pattern with one noteworthy difference. The following groups are more likely to receive administrative assistantships: non-citizens, doctoral students, male students, students who are younger, students who are in pure research areas, students in the hard areas,

students in non-life areas. Unlike the situation with research assistantships and teaching assistantships, ethnicity was observed to be significant at the .001 level for administrative assistantships, with non-minorities more likely to receive this form of assistance.

Table 5: Higher-order Correlations of Stepwise Regression of Nine Independent Variables on Financial Aid

Independent variables in Equation	*R*	R^2	R^2 Change	*b*	Beta	*t*	*t* sig
Degree pursued	.25	.06	.06	-.31	-.25	-18.28	.000
Pure/Applied	.31	.09	.03	.20	.18	13.61	.000
Age	.35	.12	.03	-.01	-.17	-12.65	.000
Hard/Soft	.36	.13	.01	.11	.11	8.41	.000
Citizenship	.37	.14	.01	-.12	-.08	-6.43	.000

NPSAS:90
Note: The following dependent variables were included in the model but do not appear in the equation because of low significance levels: Life/Nonlife; Sex; GPA; Minority status.

In the area of loans, the variables produced five relationships significant at the .001 level. Based on these observations, the following groups of students are most likely to take out loans: students who are U.S. citizens, who are minorities, who are younger, who have a lower GPA from previous college work, and who are in an area of pure research.

Overall, the composite variable Financial Aid yielded seven relationships significant at the .001 level. Only students' ethnicity and their GPAs appeared to have no bearing on the aid outcome. Based on these observations, the following groups of students are more likely to obtain what in Malaney's hierarchy he terms better forms of aid (fellowships): non-citizens, students pursuing doctorates, male students, students who are younger, students working in a hard area, students working in a pure research field, and students working in a nonlife area of study.

Multivariate Analysis

The following nine independent variables were used in the linear regression model involving Financial Aid: citizenship, degree level, sex, ethnicity, age, GPA, hard/soft area of study, pure/applied area of study, life/nonlife area of study. The results of the regression are displayed in Table 5.

Table 5 shows that five of the nine independent variables were statistically significant in explaining nearly 14 percent of the variance in Financial Aid. The level of the degree being pursued had the greatest impact, explaining 6.1 percent of the variance. This appears to conform to the general perception that aid is more available for PhD students as opposed to masters students.

Degree level was followed in importance by the variable designated pure/applied, which explains 3.2 percent of the variance in financial aid. Based on this, students in a pure field of study are more likely to receive aid than those in an applied field. Next in importance was the variable age, which explains a further 2.8 percent of the variance. The negative sign here indicates that younger students are more likely to receive financial aid than older ones.

The variable hard/soft as applied to fields of study contributes an additional 1.2 percent toward explaining the variance in financial aid. Finally the variable dealing with citizenship adds .6 percent toward the explanation. Since the sign is negative this indicates that being a non-citizen is a better predictor of obtaining financial aid.

Since listwise deletion diminished our sample considerably when all incomplete cases were removed, we tested a second regression model using mean substitution. We were particularly interested in seeing whether substituting for the missing 1,588 GPAs would have a significant effect on our results since this variable did not contribute to our first equation. To counteract this effect we ran the regression again, using mean substitution to restore missing cases. The impact of this was to add

another variable -- sex -- to the equation, and to reassign the order and contribution of the previously mentioned variables. While sex makes a very small (.04 percent) contribution toward explaining variation, it does indicate that males have an edge on financial aid. Again, GPA did not contribute to the equation.

Discussion

The most notable divergence from Malaney's (1987) findings related to the lack of importance of GPA in predicting financial aid. While he found undergraduate grades were an important predictor of most forms of financial aid, here GPA, or rather low GPA, was only associated with taking out loans. Part of this was undoubtedly due to the large number (1588) of cases that were missing GPAs, but it also seems likely that colleges are using other measures of academic achievement such as the GRE for students whose graduate school attendance may not have directly followed their undergraduate work.

While both Malaney (1987) and Baird (1976) described a lack of discrimination based on sex in the award of fellowships, this study found males more likely to receive all forms of financial aid, including fellowships, research, teaching and administrative assistantships. Only on loans was the student's sex not a significant factor.

Both Baird (1976) and Malaney (1987) observed a significant relationship between age and the receipt of fellowships. Here we found a significant relationship between all forms of aid including loans and the student's age. In all cases, younger students are the most likely beneficiaries of such assistance. Malaney (1987) suggested that this is to be expected: younger students are more likely to apply for such assistance. We would add to this that older students may have other forms of assistance available to them such as sabbaticals, company release time and support, or personal income.

Like both Baird (1976) and Malaney (1987), this study found minorities tended to receive fellowships more than nonminorities. However, for administrative

assistantships, nonminorities were the most likely recipients. This relates to Girves and Wemmerus' 1988 finding that these assistantships have the effect of integrating and socializing students within university departments. Here, it would seem, this important benefit is more likely to be missed by many minority students. As well, minorities were more likely than nonminorities to take out a loan, consistent with Nettles 1990 study that found more minority doctoral students already owing money on undergraduate education. As well, our finding is consistent with 1991 National Research Council figures showing that minorities are using personal resources including loans to a greater extent than nonminorities.

Unlike both Hauptman (1986) and Malaney (1987), this study found significant differences between citizens and noncitizens on every category of financial aid including loans. And in every category but loans, noncitizens were more likely to obtain assistance than U.S. citizens. Even on fellowships, which Hauptman (1986) noted include some available only to citizens, noncitizens received proportionately more. While such a finding appears troubling, we should consider that relatively few noncitizens, particularly from developing countries, could attend U.S. graduate schools unassisted. Hence, in a sample like NPSAS, the noncitizens with aid are going to appear disproportionately greater in number than the citizens with aid, when judged against their respective groups.

While both Hauptman(1986) and Malaney (1987) observed a tendency for masters students to take out loans more than PhD students, this was not supported here. Borrowing was associated with PhD students, but not at a significant level. As noted previously, all other forms of aid were significantly related to status as a doctoral student, indicating that the bulk of aid continues to flow at this level.

When areas of study were considered, we found important similarities with Hauptman (1986) and Malaney (1987). Both determined that students in soft areas

such as the social sciences, arts and humanities were more likely to take out loans than students in hard areas such as physical sciences and engineering. Our results were not significant on this dimension, but clearly supported an association between all other forms of financial assistance and the student's study in a hard area. With the exception of loans, every relationship using the hard/soft categories was significant to the .001 level. Since this variable also contributed to the regression equation, we can say that students in the hard areas of study were more likely to receive what Malaney defined as better forms of aid than those in soft areas.

A similarly significant relationship was observed on the pure/applied variable, with students in pure areas more likely than students in applied areas to receive all forms of aid and better aid. This differed somewhat from Malaney (1987) who found a relationship between pure areas and fellowships and teaching assistantships, while students in applied areas were more likely to receive research and administrative assistantships. In our view, small differences in our assignment of NPSAS subject codes to the Biglan categories might account for some but not all of this difference. We suspect the remainder might be due to Malaney's work within a single institution, where perhaps research and administrative assistantships are more broadly spread among departments than they are on a national basis.

Malaney (1987) points to his regression analysis to show the importance of certain variables in determining the level of funding that students receive. While he found GPA and high GRE verbal scores the best predictors of obtaining a fellowship, our study (lacking GRE scores) does not support this[1]. GPA was not a significant predictor in our equation, perhaps because a number of GPAs were missing, but we suggest a different dynamic may be blamed. Within a single large institution such as Malaney

[1]Malaney tested a separate model which omitted the GRE scores. This increased the number of cases in the regression. The second regression explained 30% of the variance in Financial Aid. The 8% discrepancy between Malaney's first and second model in the amount of explained variance was attributed to the missing GRE verbal score in the second model.

studied, one might anticipate more student continuity throughout their studies and perhaps more internal reliance on grades, since faculty might have more confidence in their own measures than in grades assigned from outside the institution. Here, with a national sample, we detect an overall reluctance to use GPA as an important basis for assigning financial assistance. Instead, what becomes very important for the individual student seeking the best forms of aid is his/her choice of field, with pure research and hard areas of study favored with the best forms of aid.

In the absence of GRE scores, this study clearly has not been able to account for much of the variation in financial assistance. While GREs are anticipated in the 1993 NPSAS data, we do not expect this to completely explain the differences in aid allotment. Like Malaney, we suspect there are other important variables that should be considered. He focuses on the importance of letters of recommendation and on the strength of the department where the student's undergraduate degree was earned. To these we would add the importance some institutions place on a personal interview process, on previous work experience, and, at the doctoral level at least, on the dozens of idiosyncratic decisions within departments that are probably unquantifiable.

Conclusions

While the use of cross-sectional data such as NPSAS allows us to offer some tentative suggestions about those students most likely to obtain financial aid, and the types of financial aid associated with different characteristics, we are unable to say whether these aid patterns deter some students from graduate school. It seems clear that many students, particularly minorities, who receive an undergraduate degree, simply don't continue their studies at the masters and doctoral levels. This raises a number of questions which could profitably be pursued in a longitudinal study. Why don't these successful undergraduates continue their studies? How much is this a factor of existing debt load? How much is this a factor of inadequate financial and

academic advising? How much is related to lack of information about the availability of financial assistance for graduate studies? Possibly it is not the 1989-90 graduate student cohort we should be studying, but rather the group that leaves college after their first degree. While Hauptman (1986) cited a number of studies that appear to show many top undergraduates enter professional studies rather than graduate school, our data neither confirms not rejects this possibility. Nor does it answer the more pressing question of whether an increase in the available financial aid would broaden the pool of candidates to include more minorities. Malaney (1987, p. 96) suggests that "if finances are a concern in the selection of professional over graduate studies, the reason probably deals with long-term salary concerns."

Although the NPSAS data does not allow us to deal with students who did not arrive in graduate school, it should be noted that NPSAS does present the opportunity of learning more about the thinking of those students who are enrolled and who may or may not be receiving financial support. The NPSAS data includes student viewpoints on their financial aid situation, which represent another rich area for exploring some of the previously discussed outcomes. Possibly even by default, the views of some of these students who are attending graduate school may help to explain why others have taken different options.

Comparing our data with Malaney's (1987) pointed up an important difference in the relative abundance of aid. Malaney was able to write about his single institution that three-fourths of new graduate students received a fellowship or an assistantship, but we can by no means be as sanguine based on the NPSAS sample. Here, 984 graduate students out of the 7,318 total (13.4 percent) received either fellowships or assistantships. Clearly there is a big discrepancy in the aid available depending on whether one is looking at an individual well-funded graduate school or at the nation's graduate schools as a whole.

Perhaps one of the most important issues raised by this study deals with the apparently disproportionate aid awarded to nonnationals. Two previous studies, Coyle (1986) and Hauptman (1986) also touched on this issue. Coyle (1986) pointed out that more nonnational minorities received research assistantships than minorities who were U.S. citizens, while Hauptman found foreign students less likely to receive fellowships but on a par with citizens as far as teaching and research assistantships. Since we have not disaggregated our noncitizens by minority status, we are unable to verify Coyle's results. However, our study goes much further than Hauptman in showing that nonnationals now appear to be prevailing in all categories. For both institutional and national policymakers we suggest such findings raise a red flag. For researchers such as ourselves, this area obviously merits more attention.

Likewise our finding that nonminorities receive proportionately more administrative assistantships should concern individual departments and institutions, if the research on student integration, socialization and persistence is accepted. If, as both Nettles (1990) and Girves and Wemmerus (1988) suggest, assistantships are more conducive to student socialization within the department, and to increased faculty contact, then institutions and/or departments by overlooking minorities for these awards, are neglecting the very people on whom their future diversity depends. It seems these awards represent perhaps the most obvious means of assuring minority integration and commitment to their program and departmental and institutional administrators might well review their efforts in this regard.

Finally, while cross-sectional data like NPSAS does give us a sense of what is happening to these students at one point in time, it does not allow generalizations about many of the pressing issues such as the financial aid role in time to degree and completion rates overall. A followup of the same individuals would represent a significant leap forward in this area, allowing researchers to fill in these gaps.

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APPENDIX

BIGLAN CLASSIFICATIONS

APPENDIX A

NPSAS categories in which graduate students appear, as they have been assigned to Biglan academic classifications of hard/soft; pure/applied and life/nonlife.

HARD

Art
Music
Mathematics
Biological Science
Physical Science
Physical Science Technology
Civil Engineering
Electrical Engineering
Engineering Other
Engineering Technology
Architecture
Computer Science
Medical Doctor
Dentistry
Optometry
Pharmacy
Chiropractic
Veterinary
Nursing
Medicine Other
Agriculture

SOFT

Liberal Arts
Philosophy
Theology
English
Visual Performing Arts
Psychology
Economics
History
Political Science
Social Science Other
Public Administration
Social Work
Lawyer
Legal Assistant
Accounting
Finance
Business Other
Marketing
Journalism
Communications
Adult Education
Secondary Education
Education Other
Home Economics
Protective Services
Parks/Recreation
Ethnic Studies
Foreign Language

PURE

Liberal Arts
Philosophy
English
Art
Music
Mathematics
Biological Sciences
Physical Sciences
Psychology
Economics
History
Political Science
Social Science Other
Ethnic Studies
Foreign Language

APPLIED

Theology
Visual Performing Arts
Physical Science Technology
Public Administration
Social Work
Civil Engineering
Electrical Engineering
Engineering Other
Engineering Technology
Architecture
Computer Science
Lawyer
Legal Assistant
Accounting
Finance
Business Other
Marketing
Journalism
Communications
Adult Education
Secondary Education
Education Other
Medical Doctor

LIFE

Theology
Biological Sciences
Psychology
Political Science
Social Sciences Other
Public Administration
Social Work
Marketing
Journalism
Communications
Adult Education
Secondary Education
Education Other
Medical Doctor
Dentistry
Optometry
Pharmacy
Chiropractic
Veterinary
Nursing
Medicine Other
Agriculture
Home Economics
Protective Services
Parks/Recreation
Ethnic Studies

NONLIFE

Liberal Arts
Philosophy
English
Art
Music
Visual Performing Arts
Mathematics
Physical Sciences
Physical Science Technology
Economics
History
Civil Engineering
Electrical Engineering
Engineering Other
Engineering Technology
Architecture
Computer Science
Lawyer
Legal Assistant
Accounting
Finance
Business Other
Library Science
Foreign Language